8 The view from different parts of the world: A view from Japan

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In this chapter, we first review Japan's perspective on the Kyoto Protocol, focusing on the agreement's implications for flexibility, competitiveness, and the design and operation of the Clean Development Mechanism. We then analyse Japan's Intended Nationally Determined Contributions, taking into consideration the Fukushima nuclear accident. We also discuss the importance of accepting diversified views in implementing policy objectives, with restrictions on the financing of new coal-fired plants and voluntary initiatives given as examples. After this, we discuss the importance of technology innovations and diffusions, including the example of a sectoral approach, followed by a proposal asserted by Japanese experts on revisiting climate sensitivity, in order to make the Paris conference workable and effective. Japan recognises that its major role in effective global emission reductions is to deploy high energy-efficiency technologies in the world and to develop innovative technologies.

1 The Kyoto Protocol: Japan's perspective

Though the top-down style Kyoto Protocol was the first step to cope with climate change globally, it was not as effective as expected (IPCC 2014). In this chapter, we would like to discuss in particular Japan's view on the Protocol. There are three points: lack of flexibility, lack of competitiveness concern among developed countries, and bitter experience with the Clean Development Mechanism (CDM).

Several months after the Fukushima disaster caused by the tsunami on 11 March 2011, all 54 nuclear power plants including those in Fukushima were forced to stop operations. As of June 2015, the situation remains unchanged. As a result, Japan's energy-related

CO_2 emissions in 2013 were 1235 $MtCO_2$, an increase of about 100 $MtCO_2$ compared to 2010. Annual average emissions for the first commitment period of the Protocol have slightly exceeded those of 1990. Because of the lack of flexible provisions to cope with such an unforeseeable situation in the Protocol, however, Japan had to comply with its commitment by purchasing 74 $MtCO_2$eq. credits. It is our view that for the coming new accord in Paris, *clausula rebus sic stantibus* (the principle of changed circumstances) should be applied to all countries' pledges.

Only industrialised countries assumed emissions caps under the Protocol, though the US did not ratify it. There were several concerns among participating countries. These included, but were not limited to, equity with respect to their commitments and competitiveness issues among developed and developing countries. Throughout the first commitment period of the Protocol, Japanese energy-intensive sectors felt that they were disadvantaged. Take the global merchandise trade in 2013, for example. Japan competes fiercely with China and Korea in exporting to the US and the EU, and among the top five countries for Japan's exports, three (China, Korea and Chinese Taipei, representing 31.8% of Japan's exports) assume no emissions cap. In contrast, around 60% of Germany's exports go to European countries that assume a cap and the portion to China is only 6.1%. For the US, although China is its 4th largest export market, the share of US exports going to China is still rather small at 7.7% (WTO 2015).[1]

It is our view that, in evaluating each country's Intended Nationally Determined Contribution (INDC), the issue of competitiveness should definitely be taken into account.

The environmental and cost effectiveness of the CDM were not as high as expected due to controversy over additionality (baseline setting), leakage, transaction costs, and so on (Okazaki and Yamaguchi 2011, IPCC 2014). Here we focus on how Japanese industrial sectors were discouraged by this mechanism. Most of them are willing to contribute to reducing global emissions by providing state-of-the-art technologies to developing countries. What happened in reality, however, was quite different. Most

1 Another example is that most models calculated that Japan's carbon price to implement the target under the Kyoto Protocol was higher than *those* of the US and the EU, as shown in IPCC Third Assessment Report.

projects were concentrated in one country and Japanese manufacturers were forced to compete with other developed countries' manufacturers to obtain credits. If they had been asked to transfer their technologies at reasonable cost, they would have been happy and very proud to do so. They never intended to develop and diffuse technologies to obtain credits (i.e. for short-term gain); rather, the intention was to strengthen their competitive edge and, by doing so, long-term profitability.

2 The Fukushima accident and its impact on Japan's energy and climate policy: Background and analysis of Japan's INDC

The Fukushima nuclear power accident in March 2011 forced revisions to Japanese energy and climate policies, which had previously relied upon the expansion of nuclear power generation. As a result of much discussion after the Fukushima accident, the Japanese government formally decided on a new strategic energy plan in April 2014. This new plan seeks a balanced '3E+S' (economy, energy security, environment, and safety) approach. However, the plan did not specify an energy mix due to large uncertainties over perspectives on nuclear power plants, particularly regulatory and public acceptance issues.

The Japanese people fear that a return to nuclear power could invite another nuclear accident. However, it remains important for policy to evaluate different kinds of risks – not only the risk of a nuclear accident, but also the risks associated with increases in electricity costs (which can weaken industry's international competitiveness), energy security, and climate change – all at the same time. Very often, these risks conflict with each other. The government should clearly explain such risk-risk trade-offs to the people.

There are no operating nuclear power reactors in Japan as of June 2015, and as a result Japan's GHG emissions hit their worst record in 2013. Furthermore, additional costs for purchasing fossil fuels from overseas to substitute for nuclear power were 3.7 trillion yen in FY2013. Consequently, electricity prices are increasing. Renewable energy may be preferable for reducing CO2 emissions as well as to ensure energy security, but it is still very costly. In order to deploy renewable energies widely, the government introduced the Feed-in Tariff (FiT) in 2012. The tariffs for solar photovoltaics have been reduced gradually, but in FY2014 they were still as high as 37 and 32 yen/kWh for residential and non-residential photovoltaics, respectively. The total capacities of photovoltaics applied for and approved by the government reached 70.2 GW by the end of November 2014 (total power capacity in Japan was about 290 GW in 2012), and the additional cost burden due to the FiT is expected to be 1.3 trillion yen annually from 2015 and to accumulate yearly. In addition, large installations of intermittent wind power and photovoltaics entail large additional costs to stabilise grids, particularly in Japan where the electricity grid is not connected to any of those in other countries due to its geography. In this situation, nuclear power, still competitive in Japan, is deemed to contribute to Japan's energy independence and is indispensable to emissions reductions.

In order to prepare Japan's INDC for submission to the Paris conference, the INDCs were discussed in the Joint Expert's Meeting of the Central Environment Council and the Industrial Structure Council (discussions were open to the public). The government proposed a detailed energy mix plan and a draft INDC for 2030 at the meeting at the end of April 2015, and decided them at the beginning of July 2015 (Table 1). The proposed GHG emission target in 2030 is a 26% reduction relative to 2013 (a 25% reduction relative to 2005). The emissions reduction target for the INDC was submitted to the UNFCCC in July 2015. According to our analysis using the RITE DNE21+ model,[2] the marginal abatement cost for the proposed 26% emissions reduction is about \$380 per tCO_2, while those for reductions in the EU by 2030 and the US by 2025 are about \$166 per tCO_2 and \$60-69 per tCO_2, respectively. It is considered that the estimated high abatement cost for Japan results from the large amount of energy saving required to achieve the target in a situation where high energy efficiency already widely prevails (Oda et al. 2012). Japan's emissions reduction target is very ambitious and one that will be extremely challenging to achieve (for discussions on the comparability of emissions reduction efforts across countries, see Aldy and Pizer 2015).

2 The DNE21+ model is a climate change mitigation assessment model that covers the whole world, divided into 54 regions, and treats over 300 kinds of technologies by bottom-up manner (Akimoto et al. 2010).

Table 1 Japan's energy mix and pledged target greenhouse gas emissions reduction for 2030

Primary energy	Electricity generation	Greenhouse gas emissions	
Share by source	Share by source	Relative to 2013	$MtCO_2$ (relative to 2013)
Oil: 32%	Oil: 3%	Total GHG: -26.0%	Total energy-related CO_2: 927 (-308)
Coal: 25%	Coal: 26%	Energy-related CO_2: -21.9%	Industry: 401 (-29)
Natural gas: 18%	Natural gas: 27%	Other GHGs: -1.5%	Commercial: 168 (-111)
Nuclear: 11-10%	Nuclear: 22-20%	Sink: -2.6%	Residential: 122 (-79)
Renewables: 13-14%	Renewables: 22-24%		Transport: 163 (-62)
			Conversion: 73 (-28)

Notes: Among industry and energy conversion sectors, major sub-sectors have individual commitments not formally included here. For example, emissions reduction targets by sub-sector are: iron & steel – 9 $MtCO_2$ from baseline; chemicals – 2 $MtCO_2$ from baseline; paper & pulp – 2.86 $MtCO_2$ from baseline; cement – energy-intensity improvement of 49 MJ/t-cement relative to 2010. These are voluntary commitments under the Japan Business Federation's (*Keidanren's*) 'Commitment to a Low Carbon Society'.

Source: Document submitted to the Government Committee on Japan's INDC, 30 April 2015.

3 The importance of accepting diversified views: The ideal versus the reality

Here we argue that for any policy to be effective and feasible, it is necessary to pay full attention to the diversity of each country's situation, values, and culture. Pursuing the idealistic situation may not necessarily lead to the expected outcome. We also stress the importance of balanced views between combatting climate change and satisfying basic human needs.

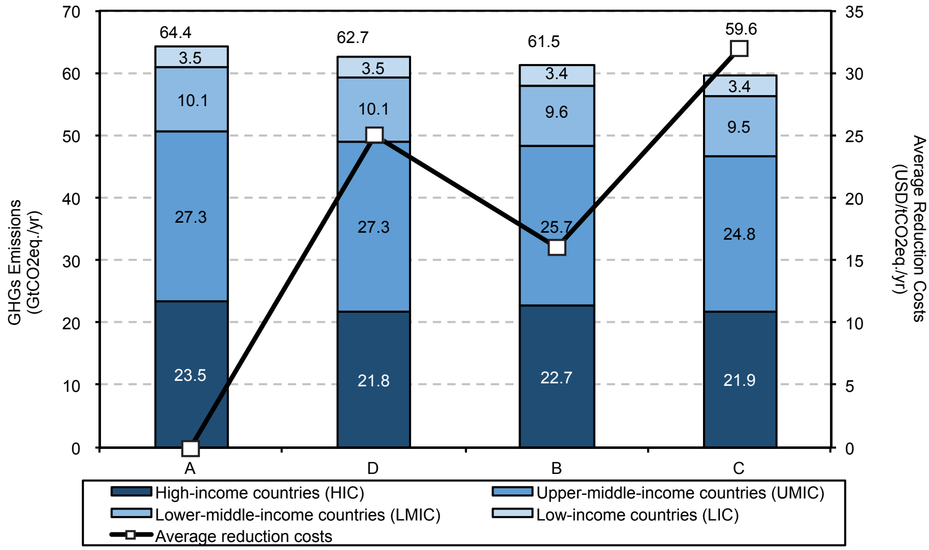
3.1 Analysis of the restrictions of financing for new coal-fired power plants

In June 2013, President Obama called for an end to US public financing of new coal power plants overseas that emit more than 500 gCO_2/kWh (White House 2013). This was a de facto ban on public financing for any new non-CCS coal power plant, excluding in the least developed countries. Several European countries and international institutions, including the World Bank, followed suit. The US, jointly with the UK and the Netherlands, proposed almost the same kind of restrictions on public financing of new coal plants to the OECD (White House 2014). The purpose of this is to reduce global CO_2 emissions. The policy will be very effective in achieving the objective if it works well and if the reduction of emissions in developing countries is prioritised over keeping the lights on. This will not be the case in developing countries, so we need to look for the second-best scenario.

Nagashima et al. (2015), using the DNE21+ model (Akimoto et al. 2010), shed light on the efficacy and efficiency of this policy. The authors compared four different cases focusing on GHG emissions and average reduction cost (see the definition of scenarios in Figure 1). Under case A, no ban is imposed (all new coal plants are eligible for public financing). Under case B, only new, high-efficiency coal power plants such as ultra supercritical (USC) and integrated coal gasification combined cycle (IGCC) plants are eligible for public financing. Case C corresponds to the imposition of the proposed ban (all new non-CCS coal power plants are excluded from public financing). Under case D, it is assumed that the ban by developed countries will have no effect in developing countries, as upper-middle-income countries (e.g. China) and some lower-middle-income countries (e.g. India) can finance building new coal power plants for themselves as well as for lower-middle-income and lower-income countries.

Figure 1 shows the global GHG emissions in 2030 under the different scenarios ranked by descending order of total GHG emissions in 2030 by income group, along with the corresponding average reduction cost relative to the BAU scenario (case A). It is clear that global emissions in case C are the lowest, followed by cases B, D and then A. In this sense, the de facto ban on public financing by developed countries should be the most idealistic policy to reduce global emissions among the cases discussed here. Emissions for case C in 2030 are 4.8 $GtCO_2eq$ (a figure 3.2 times Japan's emissions in 2013) below those in case A. When it comes to cost, however, case C is the highest.

Figure 1 GHG emissions and average reduction cost in 2030 for coal-fired plants under different scenarios



Notes: Country classification follows the World Bank classification, in which China is a UMIC whereas India is an LMIC. Scenarios are ranked by descending order of GHGs emissions. Case A: All new coal plants are eligible for public finance (BAU) Case B: Only new, high-efficiency coal power plants are eligible for public financing; Case C: Only new coal power plants with CCS are eligible for public financing; Case D: de facto ban by developed countries (i,e. case C) has no effect on new coal power plants in developing countries. In case D, it is assumed that developed countries will only build new coal power plants with CCS. Hence the emissions reduction of 1.7 $GtCO_2eq.$ in case D relative to case A (BAU) is solely realised by HICs.

Source: Nagashima et al. (2015).

What matters here is whether case C is realistic or not; in other words, will it be implemented as is? We have to note that maintaining economic growth and keeping the lights on are crucial needs, especially in developing countries. Yang and Cui (2012) found that three-quarters of new coal plants are expected to be built in China and India. They may be able to finance these by themselves if they wish, and China in particular may also be able to finance other coal power plants in other developing countries. In that case, it may be plausible to build less expensive, low-to-medium efficiency coal power plants to secure a stable supply of electricity, unless the China-led Asian Infrastructure Investment Bank (AIIB) follows the policy of developed countries on public funding, which is rather unlikely. Hence enforcing the de facto ban policy may result in case D above. In this case, from the viewpoints of both emissions reductions and average reduction cost, case B, which allows public financing for high-efficiency coal power plants, is better than case D.

The analysis shows that each country or region has its priorities, and enforcing an idealistic policy based on the views of developed countries may not be the best way to achieve the initial objective, let alone to confront the issue of equity as emphasised by Collier (2015) in his contribution to this eBook.

3. 2 Japan's experience with the voluntary initiative as a measure to respond to climate change

Japan, unlike other major economies, relied upon the voluntary initiative to implement its commitment under the Kyoto Protocol as far as emissions from energy and industry sectors are concerned. The initiative (called the Keidanren Voluntary Action Plan), in which 61 sectors participated, not only had no provisions for penalties but was also not a voluntary 'agreement' between the government and industry sectors. It was a unilateral commitment that industry as a whole committed to as an endeavour to stabilise its annual average emissions for 2008–2012 at the 1990 level, with each sector assuming its own target. This initiative was incorporated as one of the central measures into Japan's Kyoto Target Implementing Plan. In total, average emissions for the period were 12.1% (9.5% without credits) below 1990 levels. This does not necessarily mean that the initiative was environmentally effective, as various other factors affect emissions and we do not know what BAU emissions would have been without this policy.

Tokushige et al. (2015) analysed the emissions of major sectors and found that each sector had tried hard to implement its own target. While the energy intensity of many sectors was improved, there were a few sectors where emissions increased or energy intensity worsened. However, even in the latter case, the authors found that this was due to the impact of fluctuations of economic activity surpassing their efforts. In this sense, the voluntary initiative was environmentally effective, if not cost-effective, in Japan (see also IPCC 2014 and Purvis 2009). No other major country used the voluntary agreement as the central measure for industry in coping with climate change. As a matter of fact, voluntary agreements on climate change in the early days in Europe (e.g. German industry's voluntary agreement in 1995 and the UK's Climate Change

Agreement in 2000) did not work as expected, mainly due to lack of communication between industry and government (Yamaguchi 2012).[3]

Why, then, did the voluntary initiative without any legal penalty work in Japan? There are several reasons: information sharing between industry and the government (the key factor for evaluating whether levels of targets are challenging or not); regular reviews of compliance status by government committees; high efficacy of 'name-and-shame' in Japanese society; high willingness to avoid governmental intervention; and industry's dislike of economic incentives (Yamaguchi 2012, IPCC 2014).[4] As a matter of fact, industry's voluntary commitment will again be one of the major instruments for implementing Japan's INDC.

The above experience shows that policymakers, in planning their domestic response strategies, should take into careful consideration their countries' political, economic, cultural and traditional situations in order that they may work well. Likewise, they should also accept diverse values when evaluating other countries' policies. The best policy in theory does not necessarily end up with the best outcome.

4 Japan's contribution to tackling climate change: The 'Action for Cool Earth' initiative for technology development and diffusion

In order to stabilise the temperature at any level, we have to achieve near-zero emissions in the long run. According to the IPCC Fifth Assessment Report (AR5), in order to limit the GHG concentration at 430–530 ppm CO_2eq., which almost corresponds to a 2°C

3 Take the UK's Climate Change Agreement that started in 2000. A total of 44 sectors entered into agreement with the government with 'challenging' targets for 2010. In 2002, only two years since the scheme started, 13 sectors had already achieved their 2010 target. If the government knew each sector's real emissions figures, this may have never happened. Also note the steep decline of the price of carbon in the EU Emissions Trading Scheme (EU ETS) when actual emissions figures were disclosed.

4 Most industry leaders feel that promoting R&D and long-term investment is the key to coping with climate change, and complying with their obligations by purchasing permits or paying tax would work as a disincentive for this purpose. As this may be the cheap way to satisfy their obligation, this may impede R&D and long-term investment. This is a matter of comparison, but generally speaking Japanese industry leaders put more value on the long-term view than the short-term one.

rise by 2100, marginal abatement costs will be about \$1,000–3,000 per tCO_2 in 2100 (IPCC 2014, Figure 6.21). The high costs may be interpreted as meaning that the target will be extremely costly unless new innovative technologies, unknown at this moment, emerge and revolutionary change occurs within society.

Recognising the above, the Japanese government has already launched the Action for Cool Earth initiative that focuses on, but is not limited to, innovations and diffusions of climate friendly technologies. In line with the emphasis on technology innovations, Prime Minister Shinzo Abe initiated in 2014 the Innovation for Cool Earth Forum (ICEF). The Forum hosted the first international conference in Tokyo in 2014 and is scheduled to host one every year in Tokyo.[5]

As to diffusion of state-of-the-art energy-efficient technologies, Japan has advocated a so-called sectoral approach, one of the bottom-up approaches, for several years. High energy efficiency has been achieved in many sectors among energy conversion and energy-intensive industries in Japan (Oda et al. 2012), and these experiences will contribute to global energy efficiency improvements in various sectors through global and regional sectoral cooperation for this purpose. For example, the expected global emissions reduction potentials are about 2.1, 0.43, and 0.18 $GtCO_2$ in the power, iron and steel, and cement sectors, respectively, through the broad diffusion of high energy-efficient technologies throughout the world (Akimoto 2012). Large differences in marginal abatement costs across countries may act as an impediment to realising such emission reductions, as the situation will induce industrial relocation from Japan to other countries, which will result in increased global emissions. Fair and equitable emissions reduction efforts among participants are important also from this viewpoint (see Aldy and Pizer 2015). The sectoral approach focuses on the real energy-saving and emissions reduction activities of each sector, and this way of thinking is also essential for setting each country's INDC. Note that this is quite different from the sectoral crediting mechanism, in that credit acquisition is not the purpose of the activities. One of the early platforms to advance public/private sector-based partnership was the Asian Pacific Partnership (APP), which aimed to share best practices in targeted energy-

5 See www.icef-forum.org/.

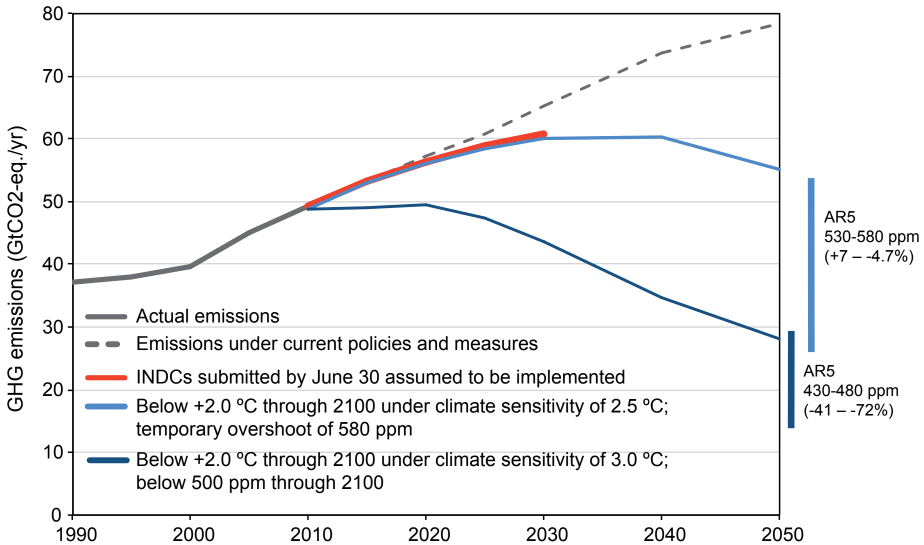
intensive sectors – such as iron and steel and cement – among seven countries, including the US, China, India, and Japan (Okazaki and Yamaguchi 2011). The Global Superior Energy Performance Partnership (GSEP) is now following many of the activities of APP. GSEP is working to accelerate energy-efficiency improvements in industrial and large building sectors. Other examples of the global sectoral approach can be seen in the marine and air transport sectors, i.e. in the International Maritime Organization and International Civil Aviation Organization (Yamaguchi 2012). The UNFCCC framework is important because it covers almost all countries, but multiple frameworks including the bottom-up approach for specific sectors will also contribute to effective emissions reductions.

6 The proposal of Japanese experts: Revisiting climate sensitivity

As described in Section 1, the challenges to achieving the 2°C target are enormous, if not impossible, and imply that current emissions levels need to be reduced by 40–70% by 2050 (IPCC 2014). The Paris agreement, based on each country's pledge – including that of the US, China, EU, Japan, and so on – will never be enough for this purpose.

It is noteworthy, however, that there is implicit evidence (Rogelj et al. 2012, IPCC 2014, Schaeffer et al. 2015) that the 40-70% reduction suggested in AR5 was based on the assumption that a best estimate or median value of climate sensitivity was 3°C (the same value as AR4), even though the likely range of climate sensitivity was lowered to 1.5–4.5°C in AR5 (from 2–4.5°C in AR4) and experts could not agree on any value of best estimate in AR5 (it was 3°C in AR4). Recent observation-based studies on climate change, however, tend to show lower climate sensitivity and best estimates (IPCC 2013, Otto et al. 2013, Lewis and Curry 2014).

Figure 2 Consistency of individual country's INDCs and the path to the 2°C target



Notes: The figure shows estimated emission pathways toward 2050 by the DNE21+ model (a global model with 54 disaggregated regions and countries that seeks cost-effective measures on emission reductions) couple with the MAGICC climate model. The grey dotted line shows the emissions pathway under current policies, the light blue line shows the emissions pathway that limits the temperature increase below 2°C over the 21st century under a climate sensitivity of 2.5°C, which corresponds to the scenario of a slight temporal overshoot of 580ppm CO_2eq. concentration. Temperature is expected to stabilise below 2°C in the long run. The dark blue line shows the emissions pathway that limits the temperature increase to below 2°C over the 21st century under a climate sensitivity of 3°C, which corresponds to the scenario under which the concentration stays below 500ppmCO_2eq. up to 2100. Temperature is expected to stabilise below 2°C even under a climate sensitivity of 3°C. The red line shows emissions until 2030 based on the assumption that individual country's INDCs (Canada, China, EU, Japan, Mexico, Norway, Russia, South Korea, Switzerland and US) known at the end of June will be implemented. In all scenarios, we assumed China's emissions in 2030 to be 16.7 GtCO_2eq. based on CO_2/GDP improvement ratio of 65% and annual GDP growth ratio of 6.2%. The US pledge covers only until 2025 and comprises two targets, i.e. 26% and 28% emissions reduction relative to 2005. We assumed here that the 28% emissions reduction will be implemented by 2025, thereafter with a linear interpolation to 80% reduction in 2050.

Source: Research Institute of Innovative Technology for the Earth.

What will happen if the best estimate is less than 3°C? What we found with the RITE DNE21+ and the simple climate change model, called Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC), is that once the best estimate is selected (for example, 2.5°C), the 2°C target will be within reach with the pledge-based Paris agreement (see Figure 2), so the agreement will become workable and feasible. Under this situation, we propose revisiting climate sensitivity and its best estimate to reduce uncertainty in decision-making by global leaders. We also argue that we should decouple the 2°C target and the 40–70% reduction. Sticking to the 2°C target and the 40–70% global emissions reduction by 2050 based on 3°C climate sensitivity without reviewing them would lead to a weak strong target that might collapse. We need a strong weak target that may be implemented as a second best policy to a strong strong target. And for this purpose, the promotion of technology innovations and diffusion will be the ultimate solution. This is the background to the initiation of ICEF.

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